

EXECUTIVE OFFICER'S SUMMARY REPORT  
9:00 a.m., September 24, 2003  
North Coast Regional Water Board  
Hearing Room  
5550 Skylane Boulevard, Suite A  
Santa Rosa, California

Item: 7

Subject: Public Hearing on Former Remco Hydraulics Facility, 934 South Main Street, Willits, Mendocino County.

Action: 1. Resolution No. R1-2003-084 Approving a Negative Declaration for In-situ Chromium Soil and Groundwater Treatment;  
2. New Waste Discharge Requirements Order No. R1-2003-085 for In-situ Chromium Soil and Groundwater Treatment; and  
3. New Waste Discharge Requirements Order No. R1-2003-086 for an In-situ Volatile Organic Compound Pilot Study.

This item is to consider adoption of a resolution approving a negative declaration for in-situ chromium soil and groundwater treatment, and two sets of proposed waste discharge requirements for the former Remco Hydraulics Facility in Willits, California (**Figure 1**). The first set of proposed waste discharge requirements is for remediation of soil and groundwater contaminated with hexavalent chromium using molasses as the bioremediation agent. The second proposed Order is for a pilot study to bioremediate volatile organic compound (VOC) contamination using two different food grade compounds; molasses with a yeast extract, and vegetable oil.

### Background

The Remco Hydraulics Facility (Remco) is a former machine shop and chrome plating facility. Remco began operations as a machine shop in 1945. Chrome plating operations began around 1963 and ceased in 1995. A detailed history of site ownership and successors-in-interest to prior owners is outlined in **Table 1**.

The Remco site is located on Highway 101 in downtown Willits across the street from a shopping center and in the middle of a residential neighborhood. There are two schools nearby. Although the City of Willits supplies domestic water to the entire area surrounding the former industrial plant, there are some domestic water wells in the vicinity that are used primarily for irrigation. All identified in-use wells in the area have been sampled. One well on Flower Street (Highway 20) revealed low-level

contamination with a VOC. The detection is the one instance where a domestic well has been affected by discharges of waste at the Remco site.

Metal cleaning solvents and other petroleum-based products such as cutting oils were used in the operation of the machine shop. Chrome plating operations required the use of high strength hexavalent chromium solutions, and solvents for degreasing purposes. The plating operations included the use of two horizontal chrome plating tanks, and five vertical tanks varying in size. The deepest vertical tank is 2 feet in diameter and 69 feet deep. Faulty design of tanks and chemical handling systems, coupled with spills, leaks, and unpermitted waste disposal activities over the operational period of the facility resulted in hexavalent chromium, VOC and petroleum hydrocarbon contamination of soil and groundwater.

Regional Water Board files contain numerous citations of occurrences when chemicals were improperly discharged to the soil surface (and hence to groundwater) as well as to surface waters. Regional Water Board enforcement actions directed at Remco date back to 1982. Hearings were conducted to refer violations of waste discharge requirements to the Office of the Attorney General. Since then, a number of Cleanup and Abatement Orders (CAOs) have been issued, leading up to the most recent one, CAO No. 99-55.

On December 10, 1996, the City of Willits filed a suit in Federal Court against Remco and the previous owners, seeking abatement of imminent endangerment pursuant to provisions of the Resource Conservation and Recovery Act (RCRA). The outcome was a negotiated settlement (Consent Decree) between the City of Willits, Remco Hydraulics, Inc., M-C Industries, Inc., Pneumo Abex Corporation, and Whitman Corporation. The Regional Water Board is not a party to the Consent Decree.

A final Consent Decree, Final Order, and Final Judgement (Case No. C-96-0283 FMS) established the Willits Environmental Remediation Trust, and was entered by the federal district court on August 22, 1997. Through this Consent Decree, the Willits Environmental Remediation Trust (WERT) acquired title to the Remco property. The purpose of the WERT is to design and implement projects to cleanup and abate the effects of soil and groundwater contamination at the Remco site, on behalf of the responsible parties, as directed by the Court and as directed by the Regional Water Board's Cleanup and Abatement Order. As part of its compliance with the judicial order and the Regional Water Board's enforcement action, the WERT is proposing to conduct the two cleanup measures noted above: the chromium cleanup and the VOC pilot study.

The majority of the soil and groundwater investigation associated with the site has been completed, and a Remedial Investigation Report submitted. The extent of groundwater contamination is shown on **Figure 2** for VOCs and **Figure 3** for hexavalent chromium. Groundwater contamination levels exceed State Department of Health Services Maximum Contaminant Levels (MCLs) for drinking water. Contaminated soils at the site are a continuing source for pollutant discharge to groundwater and may also potentially contaminate surface runoff.

### Soil and Groundwater Cleanup

The WERT has engaged the services of professional consultants to assist in cleanup of soil and groundwater contamination. Literature has been researched and studies undertaken by the WERT to determine the best alternatives available to accomplish the cleanup. The studies have advanced to the stage where a remedial alternative for reducing hexavalent chromium has been recommended. These studies and designs are contained in the reports submitted by the WERT entitled *Interim Remedial Action Workplan for Hexavalent Chromium-Affected Groundwater* dated March 11, 2003; *Addendum to Interim Remedial Action Workplan for Chromium-Affected Groundwater* dated June 18, 2003, August 20, 2003, August 22, 2003, August 28, 2003, and September 3, 2003. The recommendation is to inject a solution of molasses and water into the groundwater.

Additional study is necessary before recommending a final remedial action alternative for cleanup of VOCs and other pollutants present at the site. The WERT has proposed a pilot study to assess the effectiveness of injecting both the molasses and yeast extract solution and a solution comprised of a soy based vegetable oil into the groundwater to bioremediate the VOCs.

In August of 2000 the WERT conducted a pilot study to reduce hexavalent chromium to trivalent chromium using two different reducing agents: calcium polysulfide (lime sulfur) and molasses. The pilot studies were conducted in accordance with Waste Discharge Requirements Order No. R1-2000-54. The pilot study results showed decreases in hexavalent chromium in groundwater in both study areas. The concentrations of hexavalent chromium in groundwater monitoring wells prior to, and following the pilot study, are summarized in the tables below:

Hexavalent Chromium Concentrations in Groundwater Calcium Polysulfide Study Area		
Monitoring Well #	Prior to Pilot Study	After Pilot Study 2002 Sampling
TW-8	10,800 ppb	13 ppb
TW-9	226,000 ppb	<5 ppb
TW-10	317,000 ppb	190,000 ppb
TW-11	392,000 ppb	110,000 ppb
MW-22A	123,000 ppb	48,000 ppb
MW-24A	308,000	20,000 ppb*
*This well was sampled August 30, 2001		

Hexavalent Chromium Concentrations in Groundwater Molasses Study Area		
Monitoring Well #	Prior to Pilot Study	After Pilot Study 2002 Sampling
TW-1	697 ppb	<50 ppb
TW-4	4,600 ppb	<10 ppb
TW-5	64,400 ppb	<10 ppb
TW-6	43,600 ppb	<10 ppb
MW-7	8,460 ppb	<5 ppb

A secondary purpose of the study was to evaluate the effects of the reductants on VOCs.

In addition to studying the chemical effects that the injection solutions had on reducing contaminant levels, the project was also applied to determine how to distribute the injected solutions in an effective manner. Injection depths have been designed to disperse remedial solutions at multiple depths and at locations selected to give full coverage across the site (for chrome) and across the pilot study area (for VOCs).

These studies and designs are contained in the reports submitted by the WERT entitled *Interim Remedial Action Workplan for Hexavalent Chromium-Affected Groundwater* dated March 11, 2003; *Addendum to Interim Remedial Action Workplan for Chromium-Affected Groundwater* dated June 18, 2003 August 20, 2003, August 22, 2003, August 28, 2003, and September 3, 2003; *Work Plan for VOC Area #2 Pilot Study Program* dated March 6, 2003, and *Addendum to Work Plan for VOC Area #2 Pilot Study Program*, dated June 18, 2003, August 22, 2003, August 28, 2003, and September 3, 2003. These reports coupled with the Remedial Investigation Report comprise the Report of Waste Discharge upon which the proposed waste discharge requirements are based.

The pilot study results also revealed that the injection of molasses to groundwater causes the creation of breakdown products that are also contaminants of concern. Therefore, projects that have the potential to produce these compounds must be managed to address this concern. Provisions are included in both of the proposed waste discharge requirements to carefully monitor VOC breakdown products such as vinyl chloride, acetone, MEK, and hydrogen sulfide, as well as contingency plans to correct problems that might arise.

### **In-Situ Reduction of Hexavalent Chromium Contaminated Soil and Groundwater Interim Remedial Action**

The proposed waste discharge requirements would regulate the cleanup of groundwater contaminated with hexavalent chromium. The project being considered consists of an interim remedial action designed to reduce hexavalent chromium to trivalent chromium in-situ using a solution of molasses. Trivalent chromium is much less toxic than hexavalent chromium and is less mobile in soil and groundwater. The discharger is proposing to inject a dilute solution of molasses and water into shallow groundwater.

There are three groundwater-bearing zones at the site where permeable lenses of sands and gravels have been identified. The A-zone exists from approximately 15 to 25 feet below ground surface (BGS), the B-zone from 20 to 40 feet bgs, and the C-zone which is 35 to 60 feet bgs. There are 50 proposed injection points in the A-zone and 6 proposed injections points into the B-zone. No injections are currently proposed for the C-zone. Four locations are planned beneath the concrete floor. Additional injections of molasses may be necessary to complete the reduction of hexavalent chromium to trivalent chromium.

A 10 percent solution of molasses will be used for the more permeable soil strata (sands and gravel); and a 20 percent solution will be used for less permeable soils (silts and clays).

The treatment for hexavalent chromium in soil and groundwater is to inject a carbohydrate solution into the subsurface via a series of injection points. The readily degradable carbohydrates, once in the subsurface, are consumed by microorganisms in the aquifer. As the microorganisms degrade the carbohydrates, the available dissolved oxygen in the groundwater is depleted, producing a reducing environment. Under the reducing conditions, a number of biotic and abiotic processes occur that reduce hexavalent chromium to trivalent chromium.

The discharger has indicated that the interim remedial action may temporarily mobilize iron, manganese, arsenic, and/or antimony, and the process has the potential to generate hydrogen sulfide. However, the air-monitoring program from the pilot study preceding this proposal did not reveal that hydrogen sulfide was generated in ambient air at unsafe levels. An air-monitoring program has been prepared to monitor for potential effects of the proposed action. The hexavalent chromium will be directly reduced to trivalent chromium, which is the intended outcome of the chemical reaction. The chromium groundwater contamination is commingled with the VOC contamination, and the potential to generate vinyl chloride, and produce acetone and methyl ethyl ketone is expected. If an upward trend in the concentration of the byproducts occurs in contingency monitoring wells, a contingency plan to add an oxygen source to groundwater will be implemented. The contingency plan consists of injecting a dilute solution of hydrogen peroxide upgradient and downgradient of the injection area to prevent migration of byproducts beyond the contingency area located near the Remco eastern property line.

### **Initial Study/Checklist and Negative Declaration**

Staff prepared and circulated for comment an Initial Study/Checklist and Negative Declaration for the in-situ treatment of hexavalent chromium in soil and groundwater. It was prepared in accordance with Title 14, Section 21080(c) of the Public Resources Code and Section 15070 and 15071 of the California Code of Regulations. The Negative Declaration is proposed for adoption by the Regional Water Board.

Staff has determined, on the basis of the Initial Study/Checklist and the documents and sources referenced therein, that the project will not have a significant adverse impact on the environment, provided that the mitigation measures identified in the project applicant's Report of Waste Discharge and the related Initial Study/Checklist are included in the project. In its professional opinion, staff believes that the proposed project will have a significant beneficial effect on the environment, and is necessary to move the site towards compliance with Cleanup and Abatement Order No. 99-55.

### **Volatile Organic Compound (VOC) Pilot Study Waste Discharge Requirements**

Development of a final remedial action plan will require investigation of remedial alternatives. One such alternative is an in-situ technique to bioremediate VOCs in groundwater. The proposed waste discharge requirements regulate a pilot remediation study at the facility. The WERT proposes to study the in-situ bioremediation (also referred to as reductive dechlorination) of VOCs using two food grade products: molasses with a yeast extract and a soy-based vegetable oil (soy oil).

The pilot study consists of injecting molasses with a yeast extract on one side of the pilot study area, and a vegetable oil emulsion on the remaining half. Monitoring tracers, sodium bromide and sodium chloride (table salt), will be added to the molasses area to evaluate migration of groundwater across the study area. The pilot study area is approximately 100 feet by 150 feet in size and is shown on **Figure 2**.

A 20 percent solution of molasses, one percent yeast extract, and sodium bromide as a tracer will be injected into the permeable soils in the A-zone. A solution of 50 percent molasses with 10 percent common table salt will be injected into the less permeable silty and clayey soils in the A-zone at several depths.

The vegetable oil emulsion will be composed of soy oil, water and an emulsifying agent. The proposed depths for soy oil injections vary from 3 to about 20 feet below ground surface. Soy oil is expected to last longer in the subsurface and may help to treat contamination in soils of lower permeability.

The treatment mechanism for both molasses and soy oil is to provide a food source for the existing microorganisms in the aquifer. Microorganisms consume the food substances and "donate" electrons in the course of their metabolism. Once the electron acceptors are depleted, the microorganisms use the chlorinated ethenes and ethanes as electron acceptors. Sufficient food source is necessary over a period of time to complete the dechlorination of chlorinated ethenes and ethanes. Therefore, more than one injection may be necessary to provide a sufficient food source to complete the dechlorination process.

The discharger has indicated that the pilot study may temporarily mobilize iron, manganese, arsenic, and/or antimony. In addition, the remedial action may cause a temporary increase in the concentration of vinyl chloride and other VOC breakdown

products in the pilot study area. The same contingency plan described above will apply to injection of molasses and soy oil for the VOC pilot study.

The permitted discharge is a minor cleanup action costing less than \$1 million taken to prevent, minimize, stabilize, mitigate, or eliminate the release of hazardous waste or substance and is therefore exempt from the California Environmental Quality Act (Public Resources Code Section 21000 et seq.) pursuant to Title 14 of the California Code of Regulations, section 15330.

### **Public Comments**

Several comment letters have been received from the public. More letters are expected before the close of the comment period on September 9, 2003. A Response to Comments has been prepared for the letters received to date. An addendum to the Response to Comments document will be prepared and sent to the commenters and Regional Water Board Members under a separate cover letter for comments received after September 9, 2003. Any recommended changes to the draft Waste Discharge Orders or the Initial Study/Check and Negative Declaration will be presented to the Board at the September 24, 2003 Regional Water Board meeting.

There may be further discussion of these issues at the Board meeting as well as other issues that may arise in the meantime.

### **Preliminary Staff Recommendation**

1. Adopt Resolution No. R1-2003-083 Approving the Initial Study/Checklist and Negative Declaration for the In-situ Chromium Soil and Groundwater Treatment.
2. Adopt Waste Discharge Requirements Order No. R1-2003-084 for the In-situ Chromium Soil and Groundwater Treatment
3. Adopt Waste Discharge Requirements Order No. R1-2003-085 for the VOC Pilot Study.